

Colony of Seychelles.

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A N N U A L R E P O R T
OF THE
DEPARTMENT OF AGRICULTURE
FOR THE
YEAR 1936.

Published by Command of His Excellency the Governor.



PRINTED BY THE HEAD PRINTER,
AT THE GOVERNMENT PRINTING OFFICE,
Victoria, Mahé—Seychelles.

1938.

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-

Notes on above :

2. Appointed 16th March 1936 and arrived in the Colony on 21st April 1936.
3. Appointed 25th February 1936 and arrived in the Colony on 25th February 1936.
11. Appointed 1st July 1936.

SEYCHELLES.

Report of the Department of Agriculture for the year ended 31st
December 1936.

SECTION 1. AGRICULTURE IN THE COLONY.

(a) *Weather conditions.*

1. Appendices to this Report give (1) the meteorological return for the year, and (2) the monthly rainfall taken at the Port Office, Victoria, for the 21 year period 1916 - 1936.

2. The rainfall of 107 inches for 1936 was about 11 inches above the average for the past 21 years. The monthly distribution was good, except for two dry spells which occurred in the months of March and September. During the months of November and December, heavy downpours of rain were experienced, and these were associated with very high winds. The even distribution of rainfall in 1936 has helped to maintain the improvement, recorded in last year's report, in the general appearance of the cocconut palms.

(b) *Crop conditions*

1. THE COCONUT INDUSTRY.

Prices.

3. The following table gives the local price of coconuts and copra month by month for the past three years :—

<i>Months.</i>	<i>Copra per ton.</i>			<i>Coconuts per 1000.</i>		
	1934.	1935.	1936.	1934.	1935.	1936.
January	Rs 80	185	165	Rs 10	22	24
February	80	140	163	9	18	24
March	80	120	150	10	17	23
April	75	140	160	10	18	24
May	80	130	155	10	17	24
June	85	125	155	10	17	24
July	83	120	145	10	15	21
August	85	105	158	10	14	24
September	82	125	160	10	18	24
October	88	135	165	11	20	24
November	95	145	175	11	20	25
December	110	150	223	15	21	33

Exports.

4. The following table, taken from the Customs' returns, shows the quantities of coconut products exported during the past six years :—

	1931	1932	1933	1934	1935	1936
Copra tons.	4,875	4,680	3,217	5,565	4,311	5,135
Coconut oil hects.	33	104	80	123	...	10
Coconuts nos.	45,717	80,000	46,658	200,762	47,000	8,000
Scap kilos.	...	...	600	3,442	...	...

5. Export of copra for the past 6 year period (1931 - 1936) totals 27,783 tons, a yearly average for the period of approximately 4,630 tons. For the previous 6 years (1925 - 1930) the total exported was 30,272 tons with a yearly average of 5,045 tons.

6. It is probable that the peak of planting up this crop in suitable areas has been reached, and, in order to counteract a natural decline or cyclic variations, a higher general level of cultivation is required.

7. The total value of exports of coconut products was Rs. 865,000 in 1936 as compared with Rs. 585,642 in 1935. Although this improvement in price is satisfactory it has not yet reached the level of the pre-depression years.

Copra.

8. The general quality of copra exported has been maintained at its usual high standard. A somewhat disquieting factor, however, is to be found in the increasing number of traders who purchase nuts for conversion into copra. Complaints of the quality of the copra they produce are common. These are due to insufficient drying, and the general inadequacy of the kilns used for its manufacture. Insufficient drying of the meat means the use of less nuts to the ton of copra. In consequence, the manufacturers of poor quality copra are able to offer a higher price for the nuts, thereby forcing out the manufacturers of good copra. Happily, the activities of this class of middleman are mainly confined to the Islands of Mahé, Praslin and La Digue and do not affect the production of the outer Islands where a tradition for the manufacture of good copra has been zealously built up by the estate managements. The necessity of safeguarding the industry from the inconsequent methods of persons to whom the welfare of the industry is of little account, has already been voiced, and is engaging the attention of the Agricultural Board. The attitude of planters has shown that the introduction of Government inspection of copra would be fully supported, should no other solution of this problem be found.

Conditions on Estates.

9. On many, if not the majority, of Estates in the Granitic Islands, there has been a marked improvement in yield and in the general condition of the trees. The abnormally high rainfall for the past three years no doubt largely accounts for this improvement. The crop prospects for 1937 are likewise good. Every effort should now be made towards the improvement of general estate and soil conditions by judicious and energetic management.

10. With the improved prices many planters are gradually devoting more attention to the cultivation of their properties. On some Estates, however, the bad habits developed and excused by the plea of small returns continue. The plea has now lost most of its force, and neglect of such elementary measures as weed eradication, melittoma control, drainage, thinning out of trees, cleaning of trees, planting of cover crops, and manuring with the materials to hand, must in consequence reflect on the capacity of the management.

11. The keeping of accurate records needs to be more generally practised. Planters would then be able to apportion expenditure on Estates according to the return likely to be obtained, and prevent waste of money on unprofitable fields.

12. If planters would adopt the principle of removing coconuts from unsuitable lands these latter could be replanted with more suitable crops, and the frequently heard excuse, "there is no available land for planting other crops," would disappear.

13. The Department possesses a wide range of leguminous cover crops and planters are urged to establish varieties suitable to their particular localities to increase the nitrogen and humus contents of the soil and to smother useless weeds.

14. The importance of returning to the soil the potash stored in the dead branches and husks is again emphasised. These materials should be spread thinly in long narrow strips in the fields and burnt to ensure an even distribution of ash.

(2). ESSENTIAL OIL INDUSTRY.

Production and Exports.

15. The following table gives the quantities and values of Essential Oils exported during 1935 and 1936 :—

	1935		1936	
	Quantity	Value	Quantity	Value
	Kgs.	Rs.	Kgs.	Rs.
Cinnamon Leaf Oil	57,130	189,929	71,757	260,672
Lemongrass Oil	96	345	...	...
Patchouli Oil	4,679	28,338	2,902	31,626

16. The export of Essential Oils during the past five years was as follows :—

	1932	1933	1934	1935	1936
	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.
Cinnamon Leaf Oil	49,669	60,684	59,619	57,130	71,757
Cinnamon Bark Oil	30	29	27½	...	...
Basil Oil	3	...	...	...	...
Patchouli Oil	2,424	614½	1,919	4,679	2,902
Lemongrass Oil	...	...	18	96	...

Export.

17. The quantity of Cinnamon Leaf Oil exported during the year reached the record total of 71,757 kilos., being 11,000 kilos above the previous highest quantity exported during 1933. The value of the oil approached one-third of the value of the Colony's export of coconut products. This serves to emphasise the importance of the industry to the Colony. The increased production is attributable to improved prices for the oil, an increase of leaf due to favourable climatic conditions, and improved methods of distillation.

Marketing.

18. The Ordinance embodying the decision of the producers of Cinnamon Leaf Oil to place their overseas marketing in the hands of a selling agent became operable by the appointment of Messrs. R. C. Treatt & Co. Ltd., of London. It was agreed that the appointment should be for a period of one year dating from the 15th February 1936, and that thereafter the agency agreement would be terminable at six months' notice from either side.

19. Other points of the agreement are :—

(1) that no other agency would be appointed within the period of the agreement;

(2) that shipments of Cinnamon Leaf Oil should not be of a lesser quantity than one ton nett; but that shipment of lesser quantities of the other oils covered by the Ordinance should be accepted by the agent;

(3) commission charged on the sale of Cinnamon Leaf Oil to be at 2½% on the nett selling price and 5% in the case of other oils;

(4) sale of Cinnamon Leaf Oil to receive absolute equality of opportunity with Zanzibar Clove Oil;

(5) copies of account sales and contracts, and a monthly market report on Cinnamon Leaf Oil and Clove Oil to be supplied to the Government by the agent;

(6) that through a local firm advances against consignments would be made to certain local merchants and to any properly constituted body of distillers officially recognised and guaranteed by the Government.

20. On the recommendation of the Advisory Board the oils of *Eucalyptus citriodora*, *Palmarosa* and *Temongrass* were added to the list of oils (namely, Clove and Cinnamon oils) under the Ordinance for disposal through the appointed agent.

Cinnamon.

21. Towards the end of the year certain disturbing reports were received from the agent regarding the possible effect which uncontrolled rises in prices of eugenol essences would have on eugenol-vanillin manufacturers, who, in consequence, might be forced to adapt their plants to the use of cheaper substitutes. In order to obtain a true perspective of the future of the eugenol industry the Imperial Institute was approached for information concerning statistics of the world trade in eugenol oils, and figures for the relative costs of producing vanillin from eugenol on the one hand, and from guaiacol and safrol on the other. The Imperial Institute referred the matter to its Advisory Committee on Essential Oils and Resins. The Committee, in effect, confirmed the warnings given by the agent, and agreed that the position regarding eugenol oils was somewhat precarious. It was emphasised that the salvation of the eugenol-vanillin process was dependent upon cheap and adequate supplies of eugenol oils. A short clove crop in Zanzibar, with a consequent increase in the price of Clove oil, might seriously alter the situation in favour of guaiacol.

22. As there was evidence to show that supplies of Cinnamon Leaf Oil were being held up locally in an attempt to secure higher prices, an amendment to the Ordinance was passed, providing for the registration of all purchasers of oil named under the Ordinance and the conditions under which registration would be allowed. The principal condition was that the purchasers are compelled by law to export their oil within three months from the time of its purchase. The appointment of a sole agency for the purchase and expedition of the Colony's supply would seem desirable. This would secure close co-operation with the London agent and enable him to more effectively safeguard the future of the industry by the arrangement of contracts at prices calculated to retain the interests of vanillin manufacturers.

Prices.

23. Since the commencement of the agreement the contract price rose from 2/10d per lb. to 3/1d per lb. at the end of the year. The local price for Cinnamon Leaf Oil ranged throughout the year from Rs. 3.33 per kilo in January to Rs. 4.00 per kilo in December.

24. Another event of importance was the reduction of Import duty on Madagascar Clove Oil into America from 25% to 12½% ad valorem as from the 20th. June. This reduction is not welcome as it reduces correspondingly the preference enjoyed by Cinnamon Leaf Oil.

25. Cinnamon, like any other plant, responds to cultivation. Its distribution is chiefly the result of seed dropping by birds. Being such a hardy plant, and so readily adaptable to the lateritic and poor soils of the hillsides, its cultivation is too often neglected. Trees neglected for years make rapid recovery when the strangling effect of *Gleichenia* fern and that pernicious grass, *Panicum parvifolium*, has been removed by periodical cleaning around the bushes.

26. On hillsides thickly covered with Cinnamon, the method of clearing and exposing large areas could be improved upon by rotational cropping, and cutting the bushes in breaths, 15 feet wide, parallel to the contours. Between each of these lanes, uncut belts of 20 - 30 feet wide could be left. Such a system would tend to reduce soil erosion and weed growth.

27. The Department has assisted planters in Praslin to extend the cultivation of this useful bush by providing plants and seeds. Its value as a cover for the bare hillsides of this Island is an important consideration to the Department's action in extending this crop.

28. Despite heavy cropping the growth of the bushes throughout the year has been good, doubtless due to the heavier rainfall for the past two years.

Cinnamon Bark Oil.

29. The export of Cinnamon Bark Oil was nil; and only one or two distillations on an experimental scale were carried out.

Patchouli.

30. The local price of Patchouli oil rose steadily throughout the year from Rs. 8.50 per kilo in January to Rs. 13.50 per kilo in December. Although, the quantity exported was only 2,902 kilos, as compared with 4,679 kilos for the previous year, the value of oil exported was Rs. 31,626, as compared with an export value of Rs. 28,338 for the oil exported in 1935. The reduced quantity of oil exported is offset by an increase in the quantity of leaves exported which was 8,800 kilos. valued at Rs. 2,750, as compared with 6,600 kilos. of leaves exported during 1935, valued at Rs. 1,350. The export figures for 1936 include a considerable quantity of oil carried over from the previous year. The tests of the oil exported showed that the considerable improvement in quality has been satisfactorily maintained. The improved prices have stimulated the extension of this crop. Its cultivation, which is well understood by the local planters, is thriftily carried out under the shade of the coconut plantations generally on the lower levels. The usage of large quantities of distilled Cinnamon leaves as mulch and manure is a satisfactory feature in its cultivation.

3. MINOR INDUSTRIES AND SUBSIDIARY CROPS.

Vanilla.

31. The improvement in price of vanilla has resulted in a revival of planting and better attention being paid to the cultivation of this crop. The exports and values for the past three years are as follows :—

	<i>Exports.</i>		<i>Value.</i>
1934	Kilos.	482	Rs. 2,509
1935	"	118	" 780
1936	"	575	" 5,305

32. Assistance is being given to cultivators by supplying cuttings from the Crown Reserves, and although a considerable increase of crop may be expected during 1937 only a limited extension of vanilla cultivation is anticipated.

Coco de Mer.

33. The number of nuts exported during 1936 was 4,879 valued at Rs. 5,096 as compared with 3,829 valued at Rs. 3,411 exported during the previous year. It is anticipated that the production and export of these nuts will gradually increase. A summary of an interesting analytical report made on these nuts is given further on in this report.

Sericulture.

34. The class for instructing girls in spinning and weaving continued under the helpful supervision of Mrs Paul Lanier, M.B.E., assisted by two paid instructresses. These classes of instruction were held weekly. Mrs Lanier can no longer devote full time to this work, owing to her absence from Malé. This is unfortunate, as it has been due to her enthusiasm and control that the classes were successfully commenced.

35. It is proposed here to review the crops which are suggested in certain circumstances as being suitable subsidiary crops to the Colony's present industries.

36. The development of the experimentation with alternative crops has followed closely on the recommendations made by the Agricultural Adviser to the Secretary of State for the Colonies, who visited the Colony in 1931. At that time the depression was commencing to be felt. The poor yields of coconuts and the threat to the Cinnamon Leaf Oil industry by synthetic substitutes revealed the economic danger of depending on two or three crops of doubtful stability. There seemed to be great advantages in encouraging essential oils amongst a people of proven adaptability to the processes of distillation. Also the encouragement of intensive cultivation in a country with a limited cultivable area and a rapidly increasing population was considered.

38. Two factors have intervened, however, to hold up the work of diversification and they appear to be somewhat interdependent. Firstly, the delay which has ensued since application was made for a distillery in which the new crops could be distilled. Secondly, the apathetic attitude of the planters which has followed the return to more normal price conditions. The first factor in effect largely excuses the second one. For example, considerable plantings of *Eucalyptus citriodora* have been made, but hardly any distillations have been carried out on Estates because the distillers are too occupied with the handling of their established Cinnamon Leaf business. Planters as a general body are usually conservative in their attitude towards unfamiliar crops, and, the establishment of new crops can generally be traced to the initiative of the enterprising few.

39. The crops referred to above are reviewed as follows :—

Eucalyptus citriodora.

Facts concerning the propagation of the tree, its cultivation, pruning, etc., have been secured ; the technique of distilling fresh as well as dry leaves has been ascertained ; samples of oil have been analysed and distributed to essential oil firms by the Imperial Institute ; and remunerative offers have been received. In addition, plants have been distributed free to planters from the Department's Nurseries.

Eucalyptus staigeriana.

40. Seed of this tree was introduced in 1934 and a plot of young trees was planted out the same year on a slope in granitic sandy soil of poor quality. The growth of the young trees was slow at first, but once established, made fairly rapid progress. It seems hardy and well suited to arid conditions. Distillations of the leaves were made during the year and the oil was reported on by the Imperial Institute. The high yield of oil from the leaves, the promising report on the oil, and the growth of the trees in the experimental plots suffice to show that it is one of the most important introductions during recent years. Should Cinnamon fail, its place as the Colony's second crop might easily be filled with advantage by the oil yielding *Eucalyptii*.

Palmarosa.

41. The Department possesses two strains of this plant. One being the strain isolated by the Expert Distiller in 1932, and the other being the strain raised from seed received from the Forest Officer, Dehra Dun, India, in 1934. The latter strain growing under Seychelles conditions has produced an oil of a quality pronounced by the Imperial Institute's Advisory Committee on Essential Oils, as superior in odour. Analytical data appears in last year's Report. Many inquiries from abroad have been received both for oil and for plants. This strain, in view of its undoubted value and its successful growth on sandy plateau soil, is being propagated with all speed. Its purity being guarded, and its replacement of the first strain will be gradually effected.

Ocimums.

42. Seven species and varieties of *Ocimum* have been tried out. Grown under numbers from 1 to 7, their identification so far has been as follows :—

- | | |
|---------------|---|
| Ocimum No. 1. | <i>O. viride</i> (Willd). |
| „ 2. | <i>O. basilicum</i> L. |
| „ 3. | <i>O. sanctum</i> Linn. |
| „ 4. | <i>O. gratissimum</i> . |
| „ 5. | <i>O. Americanum</i> L. (= <i>O. canum</i> Sims). |
| „ 6. | <i>O. basilicum</i> (Toc Maria). |
| „ 7. | Not yet identified. |

It will be noted that *Ocimums* Nos. 2 and 6 have been identified as the same species.

43. Of this number, *Ocimums* Nos. 3 and 5 appear to be the most promising. Reports from the Imperial Institute on *Ocimums* Nos. 3 and 5 are given in a later chapter. slowly

44. Other plants which are suitable but which are being taken up ^{slowly} somewhat by planters are :—

1. *Pepper.*

The strains introduced a few years ago grow well and are immeasurably superior in yield to the local variety. Its propagation is slow, but the conditions for its growth, as demonstrated by the local variety, are so good that it must eventually become one of the small growers' crops of the future.

2. *Derris.*

This plant is being tried with varying success. Its cultivation is simple but a considerable acreage is necessary to produce it in marketable quantities and the possibilities of its success when planted as an intercrop in the coconut plantations has not yet been ascertained.

3. *Coffee.*

The *Robusta* variety has been propagated and distributed in considerable quantities during the past two or three years. It succeeds well in good soils under the coconuts. The low prices of the imported cheap grades somewhat deter planters from endeavouring to plant with the object of capturing the local market. Unfortunately the margin between local demand and supply is as yet too great to permit the institution of a protective tariff. The possibility of an adequate home grown supply is, however, by no means remote.

4. *Citrus.*

The propagation of commercial varieties of oranges, grapefruit and lemons is steadily proceeding. The provision of good fruit will satisfy a long felt want locally. The development of the tourist trade and more frequent calls of steamers offer opportunities for crop disposal which so far have not been realised. The need for the development of a fruit industry is fully recognised by the Department and propagation of fruit plants is proceeding as rapidly as possible.

(4) FOOD PRODUCTION.

45. After reviewing the imports for the year, it will be noted that products from agricultural and farming operations amount to close on Rs. 280,000. These products are classified as follows :—

	Quantity.		Value.
Beans and peas	Kgs. 240	Rs.	49
Butter	" 3,723		5,612
Coffee	" 69,139		15,220
Condensed milk	lbs. 16,323		6,007
Dholl and lentils	Tons. 159		16,677
Ground nuts	Kgs. 12,371		1,567
Maize	" 18,360		526
Onions	" 76,323		4,680
Rice	Tons. 2,589		223,421
		Rs.	279,759

46. From the above figures it is evident that these imported foodstuffs could be, to some extent, displaced by home grown products.

47. Recent researches have shown that "protective foods", such as milk, eggs, fruits and fresh vegetables, are vital to the proper development of children and to the maintenance of health of both adults and children. The range of food crops that is grown locally is small and it could be extended with great advantage to the entire community.

The Department is now in a position to supply planting material of good yielding varieties of beans, sweet potatoes, edible canna, tannia, and fruit trees, e. g., citrus, avocado pears, mangoes, etc.

SECTION II. WORK OF THE DEPARTMENT.

(a) *Botanical, Town and Hospital Gardens, and Government House Grounds.*

48. The above Gardens were maintained in good order throughout the year.

49. Many minor improvements were made in the Botanical Gardens, notably the lawn above the distillery which was remodelled and planted with flowering shrubs.

50. Much inconvenience is caused every year by the flooding of the Fiennes Esplanade during high tides; this is due partly to soil subsidence, and partly to want of repairs to the bridges and sea wall. The salt water destroys the grass necessitating constant replanting.

51. The propagation of foliage and flowering plants is more or less limited to the minimum requirements of the Gardens owing to the more important need for the supply of adequate quantities of economic plants.

(b) *Field experiments and demonstration plots.**Nutmeg and Coffee.*

52. The Nutmegs continue to make good growth; and each plant was given one pound of Fish Guano and half pound of mixed fertilisers containing a high percentage of nitrogen.

53. In July the more advanced Coffee trees were topped at a height of about six feet and the remaining trees were topped at a similar height in December. The topping of the trees has stimulated the production of side branches, and now, the bushes present an attractive appearance.

54. A small first crop of berries was collected between May and September and the trees flowered again in October and set a heavy crop of young fruit.

55. The whole plot was heavily mulched; and the coffee trees received similar manurial treatment to the nutmegs.

The *Gliricidia* trees were pruned twice during the year, to regulate the amount of shade.

*Eucalyptus citriodora and E. staigeriana.**E. citriodora.*

The trees in this plot were cropped, at about four feet from the ground, in April; in the middle of September ten average good trees were again cropped and they yielded 38.7 kilos. of leaves averaging 3.87 kilos. per tree. Thus, an acre, planted at 7' x 7' and cropped twice a year, would yield about 6,700 kilos. of green leaves annually, which would give about 140 litres of oil (calculated at 22 litres per ton of fresh leaves). Lemongrass has been maintained as an intercalary crop and as a source of mulch. In July an application of $\frac{3}{4}$ lb of a mixed fertiliser (same as in nutmeg plot above) was made to each tree, and its effect was quickly noticed.

E. staigeriana.

57. At the end of March the trees in this plot were cropped at about four feet from the ground; and 65 trees (of which 9 had made very poor growth) yielded 56 kilos. of leaves and 45 kilos. of stems. Since this cropping the trees have made good growth and ten average good trees, which were cut in the middle of September, yielded 31.6 kilos. of leaves averaging 3.16 kilos. per tree. Thus, under similar conditions to *E. citriodora* above, the annual yield of green leaf per acre would be about 5,300 kilos. from which about 210 litres of oil (calculated at 40 litres per ton of leaf) would be obtained. Palmarosa was maintained as a intercalary crop. Application of fertilisers was similar to that in the *E. citriodora* plot and, here again, the effect was well demonstrated.

E. citriodora interplanted with Derris elliptica and D. malaccensis.

58. The vigorous growth of this plot has been maintained, and the leaves have not been attacked by caterpillars. The *Derris* plants have been heavily pruned to furnish propagating material.

Citrus.

59. Plot A was established in 1933 and now contains three trees of Jaffa orange, one tree of West Indian lime and four trees each of Marsh seedless grapefruit,

Triumph grapefruit, Valencia orange and Washington Navel orange. The growth of these trees has been good and a few fruit were set during the year. This plot was interplanted with Palmarosa grass, which was later removed and the orchard rows were cover-cropped with *Canavalia ensiformis*, *Indigofera endecaphylla* and *Centrosema* spp. Beds, four feet wide, were made between the orchard rows and planted with sour orange stocks to be budded in 1937. Three pounds of mixed fertilisers (as used in the nutmeg plot above) were applied to each of the Citrus trees in August. The trees were sprayed, at intervals, to control rust mites and *Aphis* spp.

Plot B. The Citrus trees, which were planted in this plot in 1935, have made satisfactory growth. The orchard rows were effectively cover-cropped with *Indigofera endecaphylla*, *Calapogonium mucunoides* and *Pueraria phaseoloides*. Beds between the orchard rows were planted with sour orange stocks, *Ocimum* No. 3 and Peppers.

Excelsa coffee.

60. The growth of the trees in this plot was retarded by green scale (*Lecanium viride*): the scale insects were not controlled by spraying because they were needed as hosts for the predators, introduced by the Entomologist.

61. Most of the suitable land, on the Hermitage Estate, has now been planted and the following permanent crops were established in plots:—One-third of an acre of Ylang Ylang (*Cananga odorata*), one-third acre of *Eucalyptus staigeriana*, one-fourth acre Cinnamon and about one-sixth acre of large *Areca* nuts. The Cinnamon plot has been laid out in order to obtain some information relating to this plant's manurial requirements. Plots of the following plants were also maintained, viz:—Tous les mois (canna), several varieties of Lima beans (*Phaseolus* spp.), selected varieties of local sweet potatoes, Patchouli, *Ocimum* No. 5, Peppermint and Fodder grasses — including Uba cane. Elephant grass (*Pennisetum purpureum*), Guinea grass (*Panicum maximum*), *Paspalum dilatatum*, etc.

(c) *Plant propagation and Nursery Work.*

62. The following table gives the distribution of economic plants and seeds from the Department's Nurseries during the years 1933—1936:—

Names.	1933.	1934.	1935.	1936.
Allspice seedlings	78	136	10	419
Areca nut palms	341	1,009	9,624	267
Cacao seedlings	225	64	...	...
Cardamoms	...	120	50	96
Cinnamon seedlings	...	...	1,646	14,866
Citrus budded	...	39	35	...
Clove seedlings	10	43	75	24
Coco de mer nuts	...	242	...	...
Coconut seedlings	...	55	100	2
Coffee robusta	5,351	8,917	13,189	6,155
Coffee excelsa	...	340	2,567	475
Eucalyptus citriodora	15,120	41,797	63,580	66,265
Eucalyptus staigeriana	...	9	...	4,740
Derris malaccensis	...	...	200	4,160
Derris elliptica	...	...	...	1,410
Fodder grass clumps	...	...	...	70
Gliricidia cuttings	...	160	...	...
Lemongrass clumps	...	2,340	5,076	...
Mangoes grafted	...	4	4	...
Nutmegs seedlings	36	364	2	...
Onion seedlings	1,225	1,555	550	...
Palmarosa clumps	550	5,387	9,142	1,465
Patchouli cuttings	...	...	...	2,200
Pepper cuttings	50	253	80	10
Pineapple suckers	...	...	450	...
Tobacco seedlings	...	...	2,506	...
Vanilla cuttings	...	...	50	...
Total	22,986	62,834	108,936	102,624

63. Since the end of 1934 the plant propagation service has been financed by a free grant from the Colonial Development Fund, and there has been always a supply of planting material sufficient to meet the demands of planters. From the above table it will be seen that last year's high rate of distribution has been well maintained.

64. It will be noted that a large number of *Eucalyptus citriodora* plants were distributed; and in view of the high yield of oil from the leaves of *Eucalyptus staigeriana* and the encouraging reports as to its commercial possibilities, the propagation of seedlings of this plant commenced at the end of 1936 and was being continued rapidly to meet the demand.

65. A considerable quantity of Patchouli, Coffee, Derris and Cinnamon plants were also distributed. The majority of the Cinnamon seedlings were planted at Praslin in continuation of the Department's policy of spreading this valuable shrub in that Island.

66. The budding of selected Grapefruit and Orange varieties was actively undertaken at the end of the year when stocks became available and about 2000 young Sour Orange seedlings were transplanted to budding beds. The young Sour Orange seedlings have made very satisfactory growth, and will be suitable for budding in 1937. These will make a good supply of budded plants available in 1937.

67. The Central Nursery in Victoria and the one in South Mahé were maintained for the propagation of economic plants. Through the courtesy of a planter at La Digue it was possible to start a nursery in that Island, and with the acquisition of the Midlands Estate, Praslin, the possibility of establishing a permanent nursery on Government land was realised. It has, therefore, been possible to centralise plant propagation at Midlands and to relinquish the two Nurseries which were established on private properties. The Department desires to record its thanks to the various planters who have been so good as to provide land and facilities for the establishment of country nurseries.

68. Besides the propagation of economic plants these nurseries have served the useful purpose of demonstrating how a wide variety of essential oil crops, edible plants and fruits, fodder grasses and other crops can be grown, and the advantages to be derived from intensive cultivation.

(d) Laboratory and distillation investigations.

ANALYSES OF ESSENTIAL OILS FOR EXPORT.

69. Patchouli.

Forty seven containers of oil were examined and found to be of standard quality. The quality standard adopted is as follows :—

Specific gravity at 28°C	.95 to .995
Refractive index at 28°C	1.505 to 1.51
Optical Rotation at 28°C	- 43° to -68°
Acid value	0 to 5
Ester value	0 to 9
Ester value after acetylation	7 to 28
Solubility in 90% alcohol	Not less than 1 in 10 vols.

70. Lemongrass.

One drum containing 177.5 kilos. of oil failed to pass the test, its aldehydes 73% being 2% below the standard required for Lemongrass oil distilled from the "petite citronnelle" type.

71. An Ordinance which was passed during the year allows such oils as fail to achieve the required standard to be exported under permit, and stipulates that the dealer to whom the oils are exported be informed that the oil must not be sold as the standard produce of Seychelles.

72. The analyses of the following Essential Oils were also made :—

Cinnamon leaf oil	26
Cinnamon bark oil	12
Eucalyptus citriodora oil	3
Lemongrass oil	40
Palmarosa oil	3
Patchouli oil	4
Citronella oil	3
Clove leaf oil	3

Analytical tests carried out for the Excise Department.

73. Altogether 219 samples of Bacca and fermented liquor were received from the Superintendent of Excise for analysis. This exceeds the previous year's total by 147. When proceedings are instituted the Laboratory Assistant making the test is required to give evidence in Court. An undue amount of time is taken up with this work which tends to increase.

Work in the experimental distillery.

74. The number of distillations of material from Essential Oil plants was 165. These are summarised as follows :—

75. *Palmarosa*, (*Cymbopogon Martinii*).

Total number of distillations 23.

Objects. To ascertain yields from :—

	Highest yield obtained per ton.
(a) Fresh flower heads	10.4 litres
(b) Dried flower heads	16.6 „
(c) Stems and leaves	8.1 „
(d) Whole plant	6.3 „

76. *Lemongrass*, (*Cymbopogon citratus*).

Total number of distillations 38.

Objects. To ascertain yields and aldehydes content of :—

	Highest yield per ton.	Aldehydes content per cent by volume.
(a) Grown in shade of coconuts Beau Vallon.	2 „ litres	84%
(b) Grown exposed to sun „ „	3.22 „	82%
(c) Grown exposed to sun Botanical Gardens.	4.2 „	83%
(d) Cut on rainy day during rainy period Botanical Gardens, (Temperature of distillate 28° to 32° C).	2 „	84%
(e) Same material as (d) (Temperature of distillate 43° to 79° C).	1.7 „	79%
(f) Grass cut after a day's sun.	2.5 „	84%
(g) Grass excluding stem bases.	2.2 „	88%
(h) Stem bases.	1.5 „	89%

Four series totalling 17 fractional distillations of grass 2½ months old were made to ascertain (1) the quantity of oil obtained during each period, (2) the aldehyde content of the oil obtained, and (3) comparison of the dry steam and water distillation methods. The first fraction was taken off after 30 minutes distillation, the second 15 minutes later and the third after a further period of 30 minutes. These experiments show the following significant results :— (a) The bulk of the oil comes over during the first half hour. (b) The oil obtained during the first half hour possesses the highest aldehyde content. (c) A slightly better yield results from use of the dry steam method.

Two distillations were made with the distillate running at a temperature of 40° C to compare with two distillations running at a maximum temperature of 85° C. The experiment showed that a slightly higher yield and aldehyde content were obtained from the cooler running of the distillate.

77. *Citronella No. 5* (Ceylon variety).

Objects. To ascertain yield.

Four distillations were carried out in September from material grown at the Botanical Gardens and gave yields of six litres per ton.

78. *Eucalyptus citriodora*.*Objects.*

To ascertain (1) Weight of twigs and stems in proportion to leaves in cropping.

(2) Effect of fermentation of leaf on oil content.

(3) Effect of storage of dry leaves on oil content.

211.5 kilos were collected on the same day and mixed together.

Weight of leaves (fresh) = 211.5 kilos.

Weight of stems and twigs = 190 „

Twenty five kilos of the above fresh leaves were fermented in a sack for two days and then spread loosely to dry. 133 kilos of leaves were dried for 15 days, drying reduced the weight to 66 kilos. Distillation of these leaves gave the following interesting results :—

	Charge of still.	Yield per ton.
Fresh leaves	26 $\frac{3}{4}$ kilos	26.01 litres.
Leaves after 16 days drying	10 „	45 „
„ 1 month „	10 „	39 „
„ 1 $\frac{1}{2}$ „ „	10.5 „	37.1 „
Leaves allowed to ferment for 2 days and then dried for 2 months	10 „	35 „
Leaves after 3 months and 7 days drying	11 „	31.8 „
Leaves after 5 months and 7 days drying	10 „	21 „

The above clearly shows a progressive diminution of oil content when leaves are stored longer than 16 days.

79. *Eucalyptus staigeriana*.

Trees growing 10' x 6' planted in September 1934 and interplanted with Palmarosa were cropped and distilled on 20th March 1936.

Objects.

To ascertain yield.

Number of trees 65. Total weight of leaves 56 kilos. Nine trees of the 65 had made poor growth. Weight of stems 45 kilos.

Ten of the above trees were again cropped on 18th September 1936. 31.6 kilos of leaves were obtained from these trees and they gave a yield of 38 litres of oil per ton.

Eucalyptol yielding Eucalyptus highest yield = $8\frac{4}{5}$ litres per ton.

80. *Ocimums*.

Ocimum No. 1 (*O. viride*, Willd).

Number of distillations 6. Two distillations with small stems, leaves and flowers gave a yield of 4.8 litres to the ton.

Four distillations, using the whole plant, have the highest yield of 3.88 litres. Time of distillation less than two hours.

Ocimum No 3. (*O. sanctum*, Linn).

Number of distillations 15.

Objects of distillations.

To ascertain yield (1) from fresh material and (2) from dry material.

321 kilos of fresh leaves and stems were collected on 13th August 1936. 210 kilos were distilled fresh and 111 kilos were allowed to dry for 12 days and then weighed. The weight of dried leaves and stems was 19.5 kilos of which the dried leaves weighed 14 kilos. The best yield from the fresh material was 6 litres per ton. The best yield from dried leaves alone was 42.9 litres per ton. In another set of experiments with *Ocimum* No. 3 the maximum yield obtained was 7.05 litres to the ton. Distillation of the distillate gave a yield of 0.6 litres to the ton, calculated on weight of liquor distilled.

Ocimum No. 5. (*O. Americanum* = *O. canum*, Sims).

Number of distillations 2. Maximum yield obtained from fresh material = 6 litres per ton.

81. *Clove leaves.*

152 kilos. of Clove leaves were received from Niol on 1st September 1936. The leaves arrived wet and were allowed to dry in shade for 24 hours, the weight then had fallen to 132 kilos. Three lots of 30 kilos each were distilled by the cohobation method. 40 kilos. of fresh leaves were dried for 27 days, and after re-weighing were found to be 22 kilos. The four distillations produced the following results :—

<i>Time of distillation.</i>	<i>Rate per hour.</i>	<i>Yield per ton.</i>	<i>Phenols per cent by absorption.</i>
<i>Fresh leaves.</i>			
4 hours	36 litres	20.66 litres	87%
4 "	36 "	21.33 "	87%
4 "	36 "	21.33 "	1st hour 92%) 2nd hour 88%) * 3rd & 4th 81%)
<i>Dried leaves.</i>			
4 hours	36 litres	22 "	—

* The oil from this distillation was collected in three fractions :— 1st hour, 2nd hour, and 3rd and 4th hours.

82. *Cinnamon Leaf Oil.*

A very carefully conducted series of experiments was made to ascertain the method of securing the maximum yield of oil from Cinnamon leaves. For this purpose 16 distillations were carried out, the primal object being to compare the results of the dry steam method as opposed to the cohobation method. It had been found that when using the dry steam method, despite the use of collecting tanks, a loss of approximately two litres per ton occurred.

Points for investigation were :—

(1) To discover how the apparent loss of oil occurred when using the dry steam method and means of recovery.

(2) The relative amount of time taken and fuel consumed when using (a) cohobation, (b) dry steam. The results showed that :— (a) The time occupied when distilling by both methods is controlled by the rate of flow of the distillate which in turn is controlled by the amount of steam employed.

(b) That for example by raising the rate to 24 litres per hour the material is exhausted in 3 hours by the dry steam method and 4 hours by the cohobation method. Conversely by reducing the rate to 18 litres per hour the dry steam process occupies 4 hours and the cohobation method $5\frac{1}{2}$ hours.

(c) Allowing for the collecting of oil estimated at 1 litre per ton, from the settling tank, placed to the account of the dry steam process the cohobation method gives a superior yield of about 2 litres per ton with no effect on the quality of the oil.

(d) After collecting oil from the distillate, created by the dry steam process, by redistillation, a further quantity of oil estimated at $2\frac{1}{2}$ litres per ton can be recovered. The length of time involved by redistilling this liquid is much longer than is involved in the original distillation, consequently this operation may be ruled out as an economic proposition.

(e) It would appear, therefore, that use of the cohobation method involves approximately one-third of the time longer than that employed by the dry steam process and an extra yield of 2 litres of oil is thereby obtained.

(f) Another minor point shown by our experiments is that in the dry steam process the use of the perforated coil only, appears to give a better result.

83. *Ylang-Ylang*. (*Cananga odorata*).

Six gallons of paraffin, saturated with about 2 cwt of Ylang-Ylang flowers, were distilled for the Seychelles Produce Company. During the distillation the oil was separated into five fractions, and these were submitted to the Imperial Institute for examination. The Imperial Institute reported that the constants of the oils were similar to those recorded for Philippine samples of Ylang-Ylang. They contained only small amounts of esters and they resembled, in this respect, *Cananga* rather than Ylang-Ylang oils.

The odour of these oils was inferior and unusual, but it was not possible to state whether this was due to natural causes or to the method of preparation employed. When further supplies of flowers become available, it is hoped to continue the investigation on oils extracted by the direct distillation method.

84. *Cinnamon Bark Oil*.

Bark, collected from the Botanical Gardens in November 1934 and dried, was distilled in September 1936. This bark was obtained from Cinnamon bushes that had been growing for a period of about two years since their last cropping.

Dried bark, supplied from an estate, was also distilled. A comparison of the results is given below :—

	<i>Bark from Botanical Gardens.</i>	<i>Bark from Estate.</i>
Yield of oil from dry bark (litres per ton)	4.5	5.1
Aldehydes per cent by volume (Bisulphite method)	72 %	68 %
Phenols per cent by volume (Absorption method)	4 %	7 %

(e) *Livestock*.

85. The Department's "Freisian" herd was increased by the births of one heifer calf and one bull calf in July and August respectively. The loss of a yearling bull was sustained in July, inspite of careful medical attention. A post-mortem examination showed that death had been caused by pericarditis.

86. With the invaluable assistance of the agricultural authorities in Kenya, the Department imported one grade "Jersey" bull, one Black-headed Persian ram and one ewe of the same breed, one Large White boar and one Large Black sow. These animals commenced a quarantine period of six months, at Long Island, on their arrival - July 21st.

A young ram was born on November 9th.

87. Other importations of sheep were made by private persons.

88. A young "Freisian" bull was handed over to Mr. Hossen at Union Estate, La Digue, on 14th December, the usual stipulations being made with regard to facilities for the use of the animal by other cattle owners in that Island.

89. Besides the fresh importations, the herd now consists of :— One bull stationed at Praslin, one at La Digue, one at South Mahé; and at the Botanical Gardens there is a herd, consisting of one bull, three cows, two bull calves and one heifer calf.

90. In the August issue of the "Tropical Agriculturist", the Government Veterinary Surgeon points out that in Ceylon, breeding to high quality bulls will be of but little advantage unless the conditions, under which the cattle live, are improved; and food supply is of the highest importance. This Veterinarian describes conditions, similar to those obtaining in the Seychelles, when he says that, "The food supply available in villages consists almost entirely of natural pasture grass, and edible shrubs, which grow wild in waste lands, jungles, roadsides, etc". He points out the difficulty - also met with in the Seychelles - of improving pasturage, and urges the growing of fodder crops as the most practicable method available at present. The plants recommended for intensive cultivation - Elephant grass, guinea grass and other species of suitable fodder grasses - are obtainable from the Department, and planters are urged to extend their culture.

91. It must be pointed out that some stock owners keep all their calves and attempt to raise them ; with the result that the young animals are under-nourished, and well developed adults are seldom produced. It would be a far better policy to raise only the best ; and a number, for which there is an adequate milk supply : calves could be kept for two months and then sold to the butcher.

92. Concentrated foods, e. g., maize, poonac and beans, which can be produced easily in Seychelles, are seldom used because these foods are considered to be too expensive. However, stock owners would find that it would pay them to keep fewer cattle of higher milk-producing capacity, and to feed them accordingly. The Department is always ready to give information on feeding, etc.

93. Signs of malnutrition — enlarged abdomens, derangement of the hair and generally stunted appearance — have been noticed amongst cattle in some localities. Symptoms of malnutrition may be due to several causes but a contributory factor is the presence of internal parasites, which are often not suspected.

94. Some of these parasites can be effectively and cheaply treated by dosing animals with the following Copper Sulphate solution once a month :—

Dissolve one ounce of Copper Sulphate in water to make four fluid ounces of stock solution.

Dosage.

Calves 1 to 3 months old 1 teaspoonful of stock solution in 4 ozs water.

" 3 to 6 "	" 2 "	" "	in 6 "
" 6 to 12 "	" 3 to 4 "	" "	in 8 "
" over one year "	" 4 to 6 "	" "	in 10 "

Mature sheep could be given the same quantity as for young calves and proportionately less for younger animals.

Starve the animals overnight and give the dose, on an empty stomach, on the following morning.

(f) Entomology.

95. It was recorded in last year's report that a free grant had been provided by the Colonial Development Fund for the services of an Entomologist.

96. Mr D. Vesey-Fitzgerald was appointed and he commenced work early in 1936. During the year he has been engaged for four months on a survey of scale attack on coconuts in Seychelles, and for six months upon a search for suitable predators and parasites in East Africa.

97. The following is the Entomologist's report on the year's work :—

(a) Scale insect attack on coconuts still remains the major entomological problem of the Colony. The chief species concerned are the following :—

Ischnaspis longirostris Sign., the most abundant species in Mahé Island, and generally distributed throughout the granitic islands.

Lecanium tessellatum Sign., widely distributed and is the dominant form on some of the flat Islands. The attack of this species is the cause of the extensive growth of sooty-moulds on coconut leaves.

Chrysomphalus ficus Ash., very widespread but only locally abundant. This species causes serious drying of the leaves.

Pinnaspis buxi Bouche., locally abundant in some mountain districts, where attacks cause very serious drying of leaves and loss of crop. In addition to the above, serious harm is caused to various fruit and other trees by the attack of *Icerya seychellarum* West., and several species of *Lecanium*.

Coccids in Seychelles are extremely free from natural control other than the entomogenous fungi noted in former reports. *Chrysomphalus*, *Pinnaspis* and *Lecanium* are, however, parasitised to a small extent, and *Icerya* is kept in check by the coccinellid, *Rodolia chermesina* Muls., and the chrysopid, *Chrysopa flavostigma* E. F.

The following parasites and predators have been introduced into Seychelles from East Africa during 1936 :— Chalcidæ, *Aphytis chrysomphali* Merc., a parasite of *Ischnaspis* from the Usambara mountains. This species failed to become established. Coccinellidæ, *Chilocorus distigma* and *C. wahlbergi* predators on *Ischnaspis*, *Pinnaspis* and *Chrysomphalus*. *Exochomus ventralis* and *Hyperaspis usambarica* predators on *Lecanium*. All these Coccinellids, except the last mentioned, have become established.

(b) *Melittomma insulare*. The ravages of this beetle continue to be severe. The larvæ feed in the living woody tissue at the base of the bole of coconut trees, gaining entrance where the bark cracks for the emergence of the roots. The attack is manifest in two forms. In one form, which may be called the chronic form, the cumulative work of many generations of larvæ, assisted in the later stages when the tissue dies by the larvæ of *Oryctes* the "Bœuf banane beetle", so hollow out the base of the trunk that the tree falls over in full bearing. The remedy in this case is to inspect the base of trees at frequent intervals and as soon as any yellow sawdust-like powder is noticed extruding from the neighbourhood of the root collar the tree must be treated as follows:— Chisel out the bored wood as much as possible taking care to leave no place for the lodgment of water. The cut surface should then be painted with a disinfectant such as tar, and if the cavity is large it may be filled with cement. The latter operation, if undertaken, should be done slowly allowing time for drainage. Finally the base of the tree may be earthed up so that the exposed roots are covered and only the clean unbroken trunk remains above the soil level. The second form of attack may be called the acute form. In this case the *Melittomma* larvæ are present in such numbers that the tree is killed outright. The symptoms of this form are dieing and falling of the leaves, the oldest collapsing first. Finally the trunk may die whilst it is still in a standing position since there is no weight on top to overbalance it. This form of the disease is not so general as the chronic form and the factors bringing it about are not fully understood. By the time the above symptoms are manifest there appears to be no hope of saving the tree. It is however of great importance to cut down the infected palm and destroy the base of the trunk and the bases of the roots by burning. Unless this is done the tree will act as a breeding place for a large number of beetles, which vacating the diseased tree as soon as it dies, will infect other trees in the plantation.

(c) In addition to those recorded in previous reports various minor insect pests have been collected during the year and determined by the Imperial Institute of Entomology. Among these are the following:— The Weevil *Cratopus aurostriatus* Fairn., defoliating the timber tree Takamaka (*Calophyllum inophyllum*). The caterpillars of the moths *Pyrausta phœnicealis* Hb., feeding on the leaves of the Essential Oil plant "*Ocimum* No. 3", and of *Dichomeris ianthes* Meyr., feeding on the leaves of the cover crop *Indigofera endecaphylla*. The wasps, "Mouche jaune", *Polistes macænsis*, and another species *Odynerus seychellensis*, were found to be valuable predators on these and other leaf eating caterpillars. The sucking-bug *Acrosternum spicatum* Dist., puncturing the pods of the cover crop *Crotolaria anagyroides*. The native bee, *Megachile seychellensis* Cam., causing considerable minor damage to certain crops such as *Derris*, and ornamental plants such as Roses, by cutting neat oval pieces out of the leaves for the purpose of forming its nest. At times plants may be almost defoliated and the attack is often confused with the work of certain leaf eating beetles. The Coccidæ, *Lecanium perforatum*, *Chrysomphalus ficus*, *C. dictyospermi* and *Coccus mangiferae*, all of which were attacking Cinnamon.

(g) *Summary of reports received from the Imperial Mycological Institute during the year.*

98. Specimens of the diseased heart and bud of a coconut tree from Val Mer Estate were examined and identified as budrot produced by *Phytophthora palmivora*, Butler. Recommended treatment is prompt cutting down of diseased trees and burning of the heart and adjacent leaves. In cases where the first sign of disease is the appearance of rows of spots on one recently emerged leaf, a dry mixture of one part ground copper sulphate and two parts of slaked lime might be put into the midst of the young leaves. However, when wilting symptoms are noticed the whole bud is usually already dead.

99. Specimens of diseased Lemongrass (*Cymbopogon citratus*) were found to be infected with the fungus *Hernantia stellifera*, Johnst. There is no definite proof that this fungus is parasitic and the unthrifty condition of the Lemongrass plants was probably due to poor soil conditions.

100. Diseased stems of Giant Orchid (*Gramatophyllum speciosum*) were examined and found to contain non-septate mycelium which was suggestive of a *Phytophthora* or a *Pythium*. Identification could not be definite as no reproductive organs were detected either in or on the stem.

101. Swellings at the crown of seedlings of *Eucalyptus citriodora* were found to be paired tumours arising in the axils of the cotyledons which had in some instances become united. They are believed to be due to the crown gall organism *Bacterium tumefaciens* Sn. and Towns. Many species of *Eucalyptus* are liable, in the seedling stage to such tumours. The bacterium is a soil organism so that infected soil should not be used again for raising seedlings.

102. Leaves of *Eucalyptus citriodora* which had become brown at the edges and which would eventually drop off were examined and the specimens gave no definite indication of the cause of the dieback nor of its seat. It was suggested that the symptoms may have been produced by failure of the finer feeding roots. In one batch many of the leaves showed closely scattered irregular spots at first brown and becoming bleached and bearing a pycnidial fungus (*Phyllosticta* sp.); these numerous spots might account for a premature fall of the leaves.

Summary of reports received from the Imperial Institute during the year.

103. *Ocimum basilicum* (Toc Maria).

Samples of this oil were analysed and submitted to the trade for its opinion. The report of the Imperial Institute is as follows:—

"The prospects of finding a satisfactory demand for this oil in the United Kingdom are not promising. The oil has not the fragrance of the French oil of basil, which is used in this country, though there is a limited demand for it. It might be possible to dispose of the Seychelles oil in small lots from time to time, but it would seem inadvisable to encourage its production on a large scale".

104. *Ocimum sanctum*.

Four samples (A – D) of this oil were submitted to the Imperial Institute for report.

Sample A was oil distilled from soft stems and leaves. The distillation occupying $1\frac{1}{4}$ hours.

Sample B. was the fraction of oil that came over during the first half hour of distillation.

Sample C. was the fraction that was collected during the last $\frac{3}{4}$ hour of a distillation lasting for $1\frac{1}{4}$ hours.

Sample D. was oil distilled from the distillate.

The observations of (a) a firm of essential oil distillers, (b) a firm of soap-makers, and the remarks of the Imperial Institute are as follows:—

"(a) Sample A is found to be superior to the sample examined in 1934. Sample B. we find has a more lavender-like odour than A, C and D. In our opinion if the proportions of C and D are small compared with A they should be excluded. The oil should be very suitable for blending with French lavender oil in compounding lavender perfumes for soaps and also for the less expensive toilet goods. It blends well with neroli and petitgrain.

The presence of phenols in an essential oil is not a very serious drawback. Phenol-bearing oils are widely used in soap perfumery. The present oil should command a price at least equal to French spike lavender oil".

"(b) Our examination of this article shows that there are approximately 22 per cent of phenols, which confirms our suspicion of the presence of this type of substance from the odour. Although this phenol content is not altogether detrimental, it does however restrict the possible use of this oil to coloured soaps for if it was used in white soaps we are afraid discolouration would ultimately take place. We would assess this *Ocimum* oil at approximately 2s 6d per lb, in comparison with the present spike lavender oil prices".

Remarks of the Imperial Institute:— Judging from examination of these samples it would seem unlikely that any advantage would be gained by distilling the oil in two fractions. It is certainly not advisable to market the oil in two qualities, and to discard fraction C is not recommended. With regard to sample D, which, it is understood, represents oil recovered by the re-distillation of the aqueous distillate, this is definitely an inferior oil. Presumably no oil thus obtained has been included in Sample A. Should the properties of the present Sample D be typical of the oil recovered in this manner, its addition to the remainder of the oil distilled from this plant would probably lower the market value of the total oil, especially if it constitutes a significant proportion of the total oil.

If the amount of oil thus recovered is comparatively small it would probably therefore be wis r not to collect it.

It would appear from the trade reports quoted above that the oil would find a market for soap perfumery, but the trade opinions differ as to the price the oi is likely to realise. One firm is of the opinion that its value would be equal to that of French Spike Lavender Oil, which it resembles in odour, while another firm assesses the value at 2s 6d per lb. Spanish Spike Lavender Oil was recently quoted at 3s 6d to 4s per lb., spot, in London, and the French oil at 6s 6d per lb.

105. *Eucalyptus staigeriana*.

The analytical results show that the constants of the Seychelles oil agree fairly well with those oils of *Eucalyptus staigeriana* which have been produced in Australia and South Africa. The principal constituents of *Eucalyptus staigeriana* oil are stated to be limonene, citral, geraniol, geranyl acetate and sesquiterpene. Calculating from the above constants the Seychelles oil would have the following

chemical composition :—	Limonene	about 40.0 per cent.
	Citral	37.0 "
	Geraniol	7.5 "
	Geranyl acetate	12.8 "

The yield of oil mentioned as having been obtained from the leaves in Seychelles, viz., 44 litres per ton (equivalent to 3.87 per cent) compares very well with recorded figures, assuming the yield to be from the fresh leaves. In Australia the yield is stated to be 2.5 to 3.0 per cent from the dried material, or 1.2 to 1.3 per cent from the fresh leaves. On the other hand a planter in Northern Rhodesia is stated to have recorded a yield of 3.25 per cent (presumably from the fresh leaves), a figure only slightly below that obtained in Seychelles.

The oil was submitted to (a) merchants, (b) Essential Oil distillers and (c) pefumery and soap manufacturers in London, who reported respectively as follows :—

"(a) The sample seems to be very much nearer *Eucalyptus citriodora* than any of the ordinary eucalyptus oils, and it might possibly be of interest to soap makers if it could be produced and sold in competition with the cheaper perfume oils, such as citronella and lemongrass. Before it would be safe to speak definitely it would be necessary for us to know something about the price at which it could be delivered to this country, the quantities which could be looked for, and whether regularity of supplies could be counted on".

"(b) The characters of this sample are normal and it possesses a very pleasant lemon odour. There is a use for the oil in Eau de Cologne, Verbenas, etc., where a lemon note is required. Its value might be put at twice the value of rectified lemongrass oil, which would be about 4s per lb., for the present sample".

"(c) This essence, we find, is of an exceedingly good quality and we regard it as superior to the Australian essence. We have tried it as a soap perfume and find it satisfactory. We enclose three sample tablets which have been made for some time and perfumed with 16 oz., of essence to 1 cwt., of soap. Of course a better result would be obtained if the oil we e used in conjunction with suitable fixatives, but we think the samples show that the essence is stable in soap.

The oil compares favourably with the Australian oil and could replace it in use. We, however, believe that the Australian oil is only produced for home consumption under their peculiar spirit regulations, and its price is too high for export trade. The present oil, if sold at a lower price than the Australian oil, should meet with favour in the soap trade".

Remarks of Imperial Institute.

"The oil of *Eucalyptus staigeriana* has not so far been produced in commercial quantities for shipment. It does not contain sufficient amounts of citral or total geraniol to render the extraction of these constituents a commercial proposition, and its utilisation in Europe would depend upon whether some use could be found for the whole oil. It would probably find a market as a perfumery oil for use in soap making if it became available at a comparatively low price".

166. *Peppermint oil.*

Peppermint plants grown in the Department's plots yielded oil at the rate of 9.3 litres per ton of fresh material. The time of distillation being under one hour.

The results of analysis show that this oil has the characters of natural Japanese Peppermint oil derived from *Mentha arvensis*, and like this product it contains a high percentage of menthol.

The ordinary Japanese Peppermint oil which comes on the market is not the natural product but the so-called "dementholised" oil, representing natural oil from which 45 per cent of solid menthol has been separated by cooling by means of a freezing mixture. The "dementholised" oil (or commercial Japanese Peppermint oil) still contains from about 40 to 54 per cent of "total menthol". The separated menthol is exported as such.

Commercial value.

The sample was submitted to a firm of essential oil distillers in London, who furnished the following observations:—

"This oil, in possessing a high menthol content, resembles the Japanese undementholised oil. We have tested it also for flavour and find it to compare satisfactorily with Japanese qualities. Japanese undementholised oil does not come freely on to the English market and there is a limited demand for it, the usual commercial quality being dementholised. The price of the former might be about 9s to 10s per lb., and the latter 5s per lb.

Provided the oil can be produced cheaply we do not see why it should not have a commercial future".

Remarks of Imperial Institute.

"The results of this investigation show that the present oil would find a market in competition with Japanese Peppermint oil which it closely resembles, and is of similar quality. As mentioned, the oil usually exported from Japan has been freed from the solid menthol which has been separated from the cooled oil. The crystalline menthol thus extracted is exported separately and is currently quoted in London at 12s per lb., spot, duty paid.

As mentioned by the Essential Oil distillers whose observations are quoted above there is only a limited demand for the natural Japanese oil on this market, and it would be worth while to consider the de-mentholising of the present oil in the Seychelles, should its production in commercial quantities be undertaken. The bulk of the menthol is removed by subjecting the oil to a low temperature by means of ice and salt mixtures, the menthol being then filtered off and marketed separately. The so-called dementholised Peppermint oil thus produced would find a readier market than the natural oil. On the other hand if such processing is not easily practicable in the Seychelles, the market might be tested in the first place with a small consignment of natural oil.

It may be observed that the yield of oil from the plants distilled in Seychelles is rather lower than that reported to be obtained in Japan, which is from 1 to 1.6 per cent".

167. *Ocimum No 5.*

Botanical specimens of this plant were submitted to the Imperial Institute in 1934 and they were identified as *Ocimum Americanum* Mill. (= *O. canum* Sims.).

The oil was obtained from stems and leaves distilled in the green state for 45 minutes. The yield of oil was equivalent to about 2.1 litres per ton of green material. A more recent distillation gave a yield of 6 litres per ton.

The observations of (a) merchants and (b) essential oil distillers, and the remarks of the Imperial Institute are as follows:—

"(a) We consider the odour value, at any rate, of this oil to be superior to that of the ordinary lemongrass oil, as it has a less fishy note, and there should therefore be a sale for it for use in soap and perfumery if the price is competitive with lemongrass oil. Before deciding whether it would prove to be a satisfactory raw material for the manufacture of citral it would be necessary for us to have a larger sample (say 1 lb) so that the citral could be extracted and a comparison of the result made with the ordinary citral from lemongrass".

"(b) The oil has a pleasant odour suggestive of both verbena and basil oils. We consider that it might find application as a component of toilet water, colognes and similar compounds, and for use in perfuming soap.

To compete with lemongrass oil for citral production for the manufacture of ionomes the price must be in the neighbourhood of 1s 9d to 2s per lb., and the possibility of the presence of aldehydes other than citral would restrict its usefulness".

Remarks of the Imperial Institute.

"From the results of examination and the commercial reports quoted above it will be seen that the oil of the quality of the present sample might find a market in the United Kingdom as a source of citral at a price possibly not exceeding 2s per lb., but practical trials are desirable before steps are taken to produce the oil in quantity. It is therefore suggested that a sample of 1 lb., or more of the oil should be prepared and forwarded to the Imperial Institute for submission to the merchants who have expressed their willingness to arrange for a test".

108. *Coco de mer kernels.*

On chemical examination the following results were obtained :—

	per cent.
Moisture	14.1
Fat	0.3
Crude fibre	4.0
Crude Proteins (Nitrogen x 6.25)	4.7
Ash	1.0
Carbohydrates (by difference)	75.9
No true starch was present.	

The comparative ease with which the flesh breaks along the grain would render these nuts unsuitable for use as vegetable ivory, and they are too hard and too low in proteins to be employed as a feeding stuff. The insignificant amount of oil present shows the material to be outside the class of oil-seeds. It is not possible to suggest any commercial use to which the nuts could be put in the United Kingdom.

The material is stated to be of some repute as a medicine amongst Arabs and Indians, who regard it as a tonic, preservative and poison antidote, but it finds no place in European medicine. Apparently it has never been considered of sufficient interest for investigation, as no record can be found of its examination from either the medicinal or industrial standpoint. To determine whether the fruits possess medicinal properties of value in European pharmacy would require considerable research work, and it does not appear that evidence of the use of the material warrants this line of action.

(h) Plant importations and exchange.

109. Twenty nine separate consignments of seeds and plants were received from Overseas, and these include economic plants, seeds of timber trees, vegetables and decorative plants.

110. The undermentioned seeds and plants were presented to the Department and are gratefully acknowledged :—

<i>Material.</i>	<i>Received from.</i>
Seeds of <i>Victoria Regia</i> .	Royal Botanic Gardens, Kew.
" " cover crops.	Municipal Gardens, Bombay.
" " Flowering plants.	Depart. of Agriculture, Kenya.
" " "	" " Tanganyika.
" " "	Mrs Parker, Mahé Seychelles.
" " "	Major Tremlett, "
" " Capsicum.	Lady Rankine, Zanzibar.
" " Decorative plants.	Messrs Chenard & Co., Seychelles.
Mango plants.	Depart. of Agriculture, Singapore.
	Capt. Armitage, India.

111. Seeds and other specimens were sent to :—

Director, Imperial Mycological Institute ; Director, Imperial Institute ; Director, Imperial Bureau of Entomology ; Director, Royal Botanic Gardens, Kew ; Department of Agriculture, Kenya ; Department of Agriculture, Zanzibar ; Economic Botanist, Burma ; Havard University, Cuba ; Conservator of Forests, Mauritius ; Valencia Estate, Pretoria ; Municipal Gardens, Bombay ; Coconut Grove Palmetum, Florida ; Anandji Virji & Co., Bombay ; and numerous plants were supplied to tourists.

(i) *Visit to Estates and Agricultural instruction.*

112. Regular visits, by the Senior Officers of the Department, were made to estates in the Mahé and Praslin Groups.

113. The Director and Assistant Director addressed one public meeting in South Mahé, three at Grand Anse, Praslin, and two in La Digue.

114. The Department is making a fresh attempt to institute the practice of training Pupils in Agriculture, and an effort was made at the end of the year to find suitable boys. It is intended to select three suitable boys in 1937, and they will be given lectures in Agriculture, elementary Botany and Chemistry and Animal Husbandry.

(j) *Correspondence and distribution of information.*

115. 528 letters were despatched from the Department's Office. The number of Minute Papers dealt with amounted to 1,556. Various pamphlets and copies of reports were distributed to planters interested.

(k) *Agricultural Board.*

116. In accordance with His Excellency's suggestion, which was approved of by members last year, half of the fourteen members were elected by planters at a public meeting, and half were nominated by the Governor.

117. Seven meetings of the Board were held, and they were presided over by the Director of Agriculture, as Chairman. The Director gave three addresses, which dealt with subjects of current interest, and kept members of the Board "au fait" with the Department's activities. In March, the Entomologist, Mr Vesey-Fitzgerald, had the opportunity of meeting the members of the Board and discussing the various aspects of the local pest problem.

118. Valuable advice was obtained from the Board on several important matters, which included the formation of a Land Bank ; the participation by Seychelles in the Johannesburg Exhibition ; the organisation of the local Agricultural and Industrial Exhibition ; the introduction of animals ; methods for preventing the export of low grade copra, and for preventing the prædial larceny of agricultural produce.

119. On two occasions the Director conducted members of the Board on tours around the Botanical Gardens, Experimental Station and Laboratory ; and interesting discussions on the propagation and cultivation of economic plants, fruit trees, food plants, fodder grasses and distillation experiments, etc., took place.

120. The members of the Board functioned as the Central Committee for the Agricultural and Industrial Exhibition, and they assisted in the organisation of the Show and served as judges of exhibits.

121. The Board sustained a great loss in the death of Mr L. E. Lanier, who had always taken a prominent part in the agriculture of the Colony and in the Board's deliberations.

122. A public meeting of planters was held in the Carnegie Hall to elect seven members of the Board for 1937. The opinion was expressed that the past members had given good service, and they were unanimously re-elected.

(1) *Agricultural Exhibition.*

123. His Excellency the Governor A. F. Grimble, Esq., C. M. G., opened the Exhibition, which was held in the Carnegie Hall and on Gordon Square from 1 to 6.30 p.m., on the 21st and 22nd October.

124. The Central Committee which consisted of members of the Agricultural Board, with the Department as executive organised the Show, and they were ably assisted by the District Chairman in South Mahé, Praslin and La Digue, who canvassed their districts in an admirable manner.

125. Facilities for the transport of exhibits and exhibitors from Praslin and La Digue, were provided by the Port Department, which arranged for the "Alouette" to make the return journey on each of the two days preceding the Exhibition. Lorry transport of exhibits from South Mahé was also arranged.

126. In order to ensure the success of the occasion and to provide entertainment, a Gymkhana Committee, under the Chairmanship of the Inspector of Schools, organised a most attractive programme of sports on the afternoon of the second day.

127. The quality of the exhibits, in the sections containing "Agricultural Products" and "Arts and Crafts", reached a high standard, and reflected great credit on the exhibitors, who not only prepared the exhibits well, but put them up attractively. The number of exhibits in the "Livestock" section did not come up to expectation, but this may be partly attributed to the difficulty of getting the animals in from the country. In this section, a bull, two cows and two calves of the Department's Freisian herd, were on show and they were much admired.

128. The Department took a great deal of trouble in arranging a stall to demonstrate the advantages of growing new essential oil crops, food crops, leguminous cover crops and fodder grasses: methods of propagating fruit trees and budding and grafting were demonstrated; and fertilizers, spraying apparatus, implements, etc., were exhibited and the stall attracted many visitors.

129. The Department undertook to receive and deliver the exhibits, and arranged them in the Hall before the Show. The organisation of the Show entailed a considerable amount of forethought, as this was the first Show for sixteen years, and there was no fund of local experience from which to draw. Several Government Departments and private persons gave their whole hearted assistance, and thus largely contributed to the success of the Show. At the close of the Exhibition the Director thanked all those who had helped.

130. In His Excellency's address he stressed the necessity for co-operation, industry and foresight in all modern agricultural enterprises, and pointed out that the objects of the show were mainly to encourage these qualities. His Excellency congratulated the Department and its helpers on the successful efforts they had made in organising the Exhibition, and the exhibitors for sending such an admirable collection of exhibits. His Excellency also expressed the desire that there should be an annual Exhibition.

131. The gate attendance was good — there were 268 visitors on the first day, and 700, which included about 200 school children, on the second day. In comparison with previous Exhibitions, the number of exhibitors and exhibits showed a marked improvement. In 1901 the number of exhibitors was 87 and the number of exhibits 224; in 1920 there were 120 exhibitors and 400 exhibits; this year there were 155 exhibitors and 612 exhibits.

132. The prize money distributed amounted to Rs 870 and the total cost of the Exhibition was found to be Rs 914.

133. On the day after the Exhibition Mrs Paul Lanier, M. B. E., arranged a sale of exhibits which exhibitors were desirous of selling, and thus enabled several persons to dispose of their articles.

SECTION III.

(a) *Financial Statement.*

R E C E I P T S.

134. The revenue consists of :—

Receipts from plantations	...	Rs 1,063.10
Sale of timber from Crown Lands	...	„ 238.69
Rent of Crown Lands and Buildings	...	„ 21,961.82
Royalty on guano	...	„ 24,885.00
Royalty on timber from Aldabra Island	...	„ 68.94
		Rs 48,217.55

E X P E N D I T U R E.

135. The expenditure consists of :—

Personal Emoluments and Other Charges	...	Rs 26,139.28
Forestry, Rivers & Crown Land Reserves	...	„ 924.19
Upkeep of Botanical & Public Gardens	...	„ 2,269.51
Destruction of rats	...	„ 2,349.06
		Rs 31,682.04

136. Expenditure under Grants made from the Colonial Development Fund :—

Plant propagation	...	Rs 4,491.81
Afforestation	...	„ 2,958.87
Agricultural Student	...	„ 4,333.34
Entomologist	...	„ 12,857.90
		Rs 24,641.92

(b) *Departmental changes of note.*

137. Mr A. F. Nichols was appointed Assistant Director of Agriculture as from March 16th, and assumed duties on his arrival in the Colony on April 21st.

138. Mr L. D. E. F. Vesey-Fitzgerald was appointed Entomologist as from January 21st, and arrived in the Colony on February 25th.

139. Mr M. Dyer was appointed Garden Foreman as from July 1st, vice Mr E. Azemia.

SECTION IV.

(a) *Summary of legislation affecting agricultural industries during the year.*

140. Ordinance No 12 of 1936 amends the Patchouli Oil Ordinance 1934 (Ordinance No 6 of 1934), and enables the Department of Agriculture to permit the export of oil which falls below the "Standard Quality", provided the oil is exported to the agent appointed under Ordinance No 19 of 1935; and that the agent is instructed to sell such oil to the best advantage, but not as the standard produce of Seychelles. It was considered advisable to allow the export of such low grade oil, as restriction might induce exporters to mix it with good oil and thus lower the quality of all the oil.

141. Ordinance No. 13 of 1936 amends the Plant Pests Ordinance No. 12 of 1925 so as to make the definition of "Plant" in Section 2 more comprehensive, and to prohibit the importation of fruit and vegetables, which are scale - infected or likely carriers of injurious pests and diseases. Since the passing of this Ordinance the Department has inspected fruit and vegetables arriving by each mail and in most cases has carried out fumigation.

142. Ordinance No. 26 of 1936 amends the Essential Oils Export and Marketing Ordinance No. 19 of 1935 and provides for the registration of purchasers of Essential Oils. The aim of this Ordinance is to ensure the continuity of supply of Cinnamon Leaf Oil to the Vanillin manufacturers, and hence to retain their interest in this oil.

(b) *Reafforestation.*

143. Work under the Afforestation Scheme, financed by a free grant from the Colonial Development Fund, has been continued in the two areas (Niol and Morne Blanc) mentioned in last year's Report. In view of the overspending which occurred last year, it was necessary to confine expenditure within the strict limits of the allocation for the remaining period of the grant. However, it is to be regretted that curtailment of the rate of planting was necessary, as the efforts of the Department in the areas already planted have been successful and encouraging.

144. During the latter half of the year planting was concentrated in the Exile Section of the Morne Blanc area. This area is easily accessible, hence it has been mainly planted in *Casuarina equisetifolia* and *Eucalyptus robusta* to supply fuel. Small trial areas of *Eucalyptus staigeriana* and *E. viminalis* have also been planted.

145. The soil in the Exile Section is situated on steep slopes and is consequently poor. This area was covered with *Gleichenia* fern and small Cinnamon bushes. The general plan of cutting the bracken fern, about three inches above the ground and rolling it to supporting stakes arranged in contour lines, has been continued. This method has amply proved its worth as a means of reducing soil erosion to a minimum, checking weed growth, providing shelter and mulch for the young plants and effectively destroying the fern. At Exile the rate of progress was somewhat reduced as larger holes had to be prepared; and wooden stakes, to keep the contour belts of bracken fern in place, had to be transported from considerable distances.

146. All the original plantings are now well established and the growth of the trees has been good. In the cases of *Acacia molissima*, *Albizia moluccana* *Eucalyptus robusta* heights of 14 to 20 feet have been attained in twenty months from the time of planting in situ.

147. On the whole the weather was suitable for the establishment of the young seedlings, except in the months of March and April when a long spell of dry weather somewhat hampered their growth. The work of supplying new plantings was kept well in hand so that the areas planted present a regular appearance.

148. The trees have been remarkably free from insect pests or diseases - only sporadic attacks of leaf-eating caterpillars were noticed in small areas.

149. The following table summarises the total plantings made during the year, showing the various kinds of trees, and the total acreage planted :—

M O R N E B L A N C.

<u>Names.</u>	<u>Number.</u>	<u>Acreage.</u>
<i>Acacia mimosa</i>	1,500	
<i>Azalia bijuga</i>	150	
<i>Albizia moluccana</i>	1,600	
<i>Casuarina equisetifolia</i>	5,505	
<i>Cinnamomum zeylanicum</i>	2,484	
<i>Eucalyptus citriodora</i>	4,100	
<i>Eucalyptus staigeriana</i>	1,788	
<i>Eucalyptus viminalis</i>	420	
<i>Heritiera littoralis</i>	500	
<i>Pterocarpus indicus</i>	302	
	18,349	50 acres.

N I O L.

<i>Names.</i>	<i>Number.</i>	<i>Acreage.</i>
Albizzia moluccana	1,500	
Casuarina equisetifolia	2,805	
Cinnamomum zeylanicum	1,800	
Eucalyptus citriodora	900	
	<u>7,005</u>	<u>21$\frac{3}{4}$ acres.</u>

H E R M I T A G E.

<i>Names.</i>	<i>Number.</i>	<i>Acreage.</i>
Areca Nuts	319	
Calophyllum parviflorum	139	
Casuarina equisetifolia	506	
Eucalyptus citriodora	135	
Eugenia caryophyllata	181	
Lodoicea sechellarum	18	
Sandoricum indicum	145	
	<u>1,443</u>	<u>5$\frac{3}{4}$ acres.</u>

Tree seedlings issued to planters.

<i>Names.</i>	<i>Number.</i>
Acacia mimosa	265
Adenanthera pavonina	14
Azalia bijuga	35
Albizzia moluccana	3,745
Artocarpus integrifolia	112
Calophyllum parviflorum	538
Casuarina equisetifolia	32,361
Chlorophora excelsa	50
Cola acuminata	825
Eucalyptus albens	320
Eucalyptus robusta	1,610
Eucalyptus rostrata	337
Heritiera littoralis	34
Melia azederach	42
Pterocarpus indicus	11
Sandoricum indicum	51
Tectona grandis	63
Wormia ferruginea	7
	<u>40,420</u>

(c) *Fisheries.*

150. The following table shows the quantity of Guano, fishery products and birds' eggs yolk exported from the Colony during the last five years :—

			<u>1932</u>	<u>1933</u>	<u>1934</u>	<u>1935</u>	<u>1936</u>
Guano	Tons ...		14,213	12,307	12,062	10,235	23,942
<i>Fishery products.</i>							
Calipee	Kgs. ...		5,743	4,788	3,878	4,303	4,456
Fish, salted	„ ...		6,366	14,850	44,795	18,087	...
Shark fins	„ ...		1,178	...	1,413	1,144	1,342
Shark meat	„ ...		...	7,200	1,418	...	...
Trepangs	„ ...		4,107	1,933	3,837	1,547	359
Turtle oil	Lts. ...		3,500	700	400	1,984	1,383
Green turtle shell	Kgs. ...		504	514	109	168	240
Turtle meat (dried)	„ ...		2,337	1,680	751	5,538	...
Tortoise shell (Caret)	„ ...		1,434	1,191	1,104	742	1,095
Birds' eggs yolk and albumen	Kgs.	55,240	57,400	49,903	49,350	30,100	

151. The Fisheries Guard in charge took 51 contraventions and seized 106 casiers of undersized meshes during the year.

14th September, 1937.

F. L. SQUIBBS,
Director of Agriculture.

APPENDIX I.

METEOROLOGICAL RETURNS FOR 1936.

1936	Months	Temperature					Rainfall		Winds		Deaths	Remarks.
		Barometer Pressure in inches	Solar Maximum	Shade Maximum	Shade Minimum	Range	Mean	Amount in Inches	Relative Humidity %	Direction of Wind	Average Velocity	
	January	30.059	129	83.6	77.7	5.9	80.6	15.50	76.0	NW.	6.9	23
	February	30.053	130	84.7	78.7	6.0	81.7	8.56	75.4	NW.	6.7	14
	March	30.030	127	86.1	78.5	7.6	82.3	2.43	70.3	NW.	8.3	29
	April	30.057	127	85.7	78.6	7.1	82.1	6.45	71.0	NW.	5.0	29
	May	30.049	124	85.5	78.8	6.7	82.1	13.13	67.4	ESE.	6.0	29
	June	30.088	122	83.2	77.8	5.5	80.5	4.83	76.8	ESE.	10.0	46
	July	30.100	118	81.5	76.4	5.1	78.9	4.93	76.4	ESE.	10.0	33
	August	30.089	118	81.0	75.7	5.3	78.3	13.12	86.8	ESE.	11.0	25
	September	30.084	121	82.2	77.5	4.7	79.8	2.48	72.8	ESE.	11.0	26
	October	30.101	141	83.2	77.0	6.2	80.1	5.16	64.0	NW.	2.0	22
	November	30.090	128	83.1	76.5	6.6	79.8	16.25	76.3	NW.	5.0	38
	December	30.036	97	83.0	76.6	6.4	79.8	14.21	72.1	NW.	6.0	40

APPENDIX II.

Monthly Rainfall taken at the Port Office, Victoria, 1916-1936.

	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	Monthly Mean Rainfall.
January	9.31	12.93	24.18	18.02	32.63	15.80	5.33	19.31	12.60	35.25	10.77	7.84	16.72	13.19	6.18	11.16	15.13	16.96	12.85	19.35	15.50	14.37
February	7.17	10.12	4.64	11.94	5.95	13.36	1.78	14.29	1.85	13.65	15.85	0.60	14.78	12.44	8.85	18.68	1.00	12.05	21.36	12.31	8.56	9.9
March	6.96	1.68	2.33	12.86	12.58	4.75	11.94	12.15	15.14	22.76	7.48	1.62	22.72	14.75	7.19	2.02	12.12	9.01	6.63	14.27	2.43	9.67
April	9.25	9.69	2.34	6.53	0.76	8.58	5.57	9.07	16.27	14.52	10.42	5.13	14.74	5.66	6.55	2.21	0.93	7.00	4.16	10.95	6.45	7.37
May	8.06	0.45	2.92	13.42	6.66	7.66	5.73	8.17	4.93	5.70	16.26	6.71	15.64	3.73	3.51	9.80	5.53	6.01	5.65	6.58	13.13	7.49
June	4.29	1.09	0.95	9.25	3.50	1.20	4.10	4.47	3.42	1.16	15.94	7.24	2.69	0.67	3.62	4.06	1.87	4.05	2.54	6.27	4.83	4.15
July	5.63	3.67	1.41	4.78	2.39	7.05	2.16	0.43	7.07	4.98	11.12	1.92	3.12	1.36	3.42	2.44	2.44	2.06	22.90	13.63	4.94	4.24
August	0.50	3.18	1.78	0.44	0.87	1.06	1.63	4.37	0.91	5.79	2.14	1.05	0.55	1.79	1.87	1.14	1.64	2.02	14.30	3.50	13.12	3.03
September	0.50	3.96	14.23	4.85	No Record.	0.32	4.69	6.93	8.13	5.35	0.14	5.04	2.53	1.44	8.68	0.14	4.14	5.07	23.25	2.77	2.48	5.08
October	1.13	0.45	9.14	5.05		2.34	9.91	15.35	12.24	10.79	4.49	14.09	1.83	3.24	2.11	8.41	12.65	5.00	4.84	6.75	5.16	6.41
November	1.10	6.94	8.92	1.23		7.84	1.88	8.85	10.75	15.58	7.52	5.36	10.23	5.17	20.59	5.78	5.97	9.05	8.53	11.42	16.25	8.24
December	10.15	12.03	9.95	12.66	15.20	16.11	3.50	8.10	15.05	8.77	20.89	10.59	2.80	10.94	13.25	29.30	10.18	13.05	18.05	13.66	14.21	14.00
Total	67.35	66.22	82.79	101.03	80.54	86.58	57.22	101.62	118.36	134.30	123.02	67.19	134.35	74.43	85.82	95.14	73.60	96.06	145.06	121.46	107.06	...

Average year = 96.15 inches

